

*EFFECTS OF A CHECKLIST ON
SELF-ASSESSMENT OF BLOOD GLUCOSE
LEVEL BY A MEMORY-IMPAIRED WOMAN WITH
DIABETES MELLITUS*

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This study evaluated effects of a checklist on the accuracy of self-assessment of blood glucose level by a diabetic woman with memory impairments caused by viral encephalitis. The checklist consisted of 54 steps for operating an electronic glucometer, which the subject performed in sequence and checked off when completed. Following introduction of the checklist, the percentage of steps completed correctly increased in simulated and actual blood glucose tests and yielded clinically useful information.

DESCRIPTORS: antecedent control, textual prompts, memory aids, brain injury, diabetes management

Impaired memory and delayed reacquisition of verbal and motor skills are among the significant sequelae to brain injury. These disabilities can have adverse effects on clients' social relationships, employment, and performance of tasks necessary for independent living. The rehabilitation literature often recommends using visual and textual stimuli, such as calendars, appointment books, and lists of things to do, as prosthetic memory aids for brain-injured clients. Empirical research supporting these recommendations, however, is far from extensive. Written prompts have been validated as effective prosthetic aids for persons with brain injury to increase completion rate of vocational rehabilitation assignments and self-care tasks

(Zencius, Wesolowski, Burke, & McQuade, 1991), to restore appropriate conversational skills (Bourgeois, 1990, 1993), and to increase accurate answers to orientation questions (Zencius, Wesolowski, & Rodriguez, 1998). Negotiated tasks, picture prompts showing the desired work activity, and immediate review of the completed activity plus verbal rehearsal of the upcoming activity have also been used to improve work performance and to decrease disruptive behavior in adolescents with traumatic brain injury (Feeney & Ylvisaker, 1995). The present study evaluated the effects of a detailed checklist in assisting a memory-impaired woman with insulin-dependent diabetes mellitus to perform the multiple steps necessary to correctly use an electronic blood serum glucometer.

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METHOD

Participant and Setting

The participant was a 56-year-old woman who had contracted viral encephalitis 1 year

prior to this study. She was hospitalized with a high fever and later manifested disorientation, confusion, and aphasia. A neuropsychological evaluation conducted shortly before this study began revealed severe impairments to her verbal and visual memory and orientation to place and time. During this study the participant continued to exhibit disturbances in orientation, memory, sleep patterns, and receptive and expressive communication. In addition to her neurological problems the participant had a lengthy history of diabetes mellitus, which had been adequately managed with diet and insulin injections. The present treatment was conducted at a community-based center for persons with head injury.

Blood Glucose Tests

An essential part of this participant's regime for managing her diabetes was the accurate assessment of her blood glucose level at least twice a day. The procedure involved setting up the test equipment, cleaning the puncture site, pricking her finger with a lancet, placing the blood sample on an electronic glucometer, reading the output and recording it on a log, cleaning the glucometer, and disposing of used materials. Data were collected during sessions in which the participant actually collected a blood sample and during sessions in which she simulated taking a blood sample (used a lancet without a needle). Procedures during actual and simulated tests were identical except for use of the blunted lancet and bogus glucometer readings (numbers taped to the glucometer display) in the simulated tests.

Observations

Based on the glucometer instruction manual, a 54-item checklist was developed that included all of the steps needed to accurately and safely conduct a blood glucose test. (Copies of the checklist may be obtained by writing to the first author.) This checklist

was used to record the number of steps that the participant performed correctly without prompts. The therapist (the second author) collected primary data, and a second observer (the third or first author) also periodically collected data to assess interobserver reliability. Reliability was computed by dividing the number of item-by-item agreements by number of agreements plus disagreements and multiplying by 100%. Interobserver reliability checks conducted during 21% of the sessions in baseline and training conditions yielded mean percentage of agreement coefficients of 91% (range, 88% to 94%) for simulated tests and 95% (range, 91% to 100%) for actual tests.

Procedure

Baseline. In these sessions the participant was given her glucometer and materials and was asked to begin her blood sugar test. Following an error or a pause for more than 30 s the therapist said, "Let me help you," then picked up the materials and prepared them for the next step in the sequence. This process continued until all steps in the sequence were presented and scored as either correct or incorrect.

Training and checklist. Preliminary meetings with the participant revealed that her word recognition and comprehension skills were largely intact, suggesting that she might benefit from textual prompts in the form of a task checklist. The participant was given the 54-item checklist and taught how to use the memory aid. She was asked to read the instructions for the first step, perform the step, check off that item on the list, advance to the next step in the sequence, and repeat this process until all items were checked. Initially, small labels (e.g., "lancet") were taped to equipment that the participant had difficulty recognizing. During training she was praised for performing steps properly and was given corrective feedback for errors. After three consecutive sessions in which she

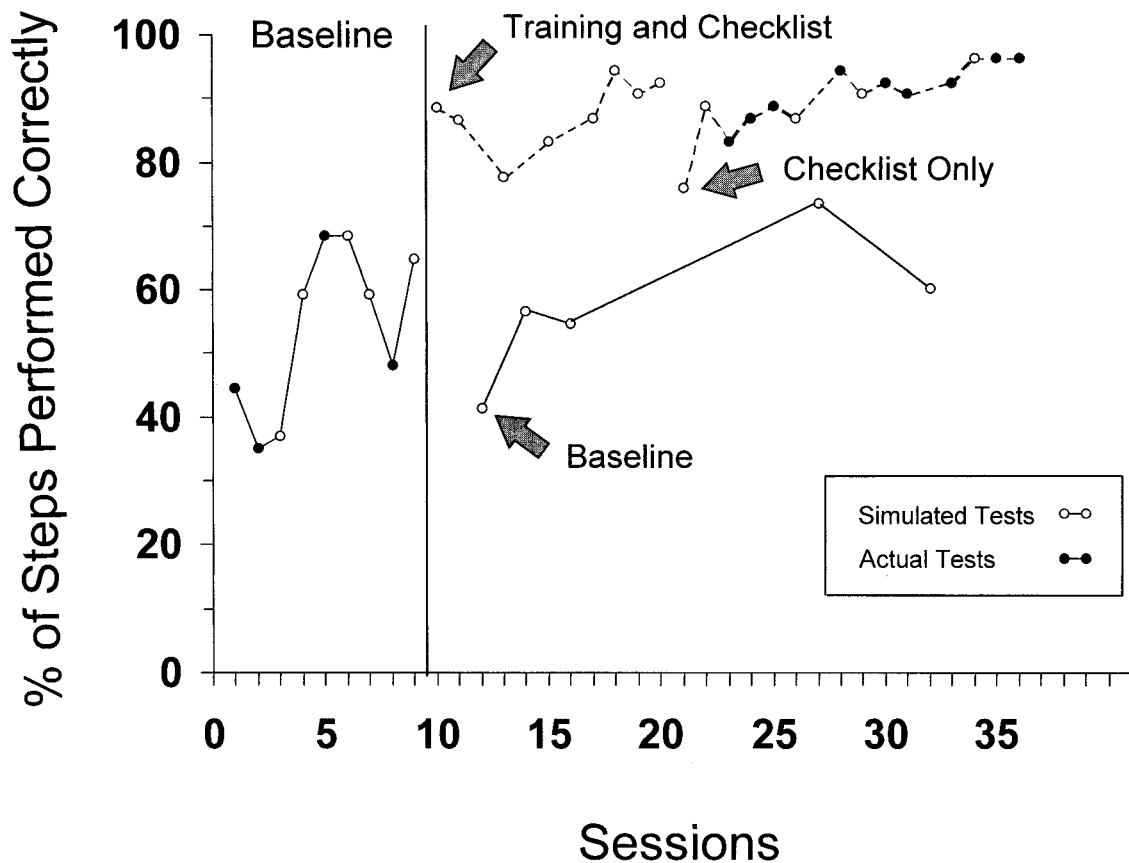


Figure 1. Percentage of steps performed correctly in simulated and actual blood glucose tests in baseline, training and checklist, and checklist-only conditions.

scored above 90% correct and made no critical errors that would result in an inaccurate reading or risk infection, the checklist-only condition was initiated.

Checklist only. In these sessions, the participant was given her glucometer and task checklist and was asked to conduct her blood sugar test, but equipment labels were removed and all verbal prompts and feedback were discontinued.

Experimental Design

Effects of training and the checklist on performance in the simulated tests were evaluated within a multielement design. Following a baseline phase, sessions in which the checklist was present were randomly alter-

nated with sessions in which the checklist was absent.

RESULTS AND DISCUSSION

Figure 1 shows the percentage of the 54 checklist items performed correctly during the simulated and actual blood tests. The participant's performance during the baseline phase was highly variable with a positive trend, but reached a plateau below 70% of steps performed correctly. This level of performance often resulted in inaccurate blood glucose readings and failures to carry out precautions needed for infection control (e.g., wipe finger with alcohol pad). When training and the checklist were first intro-

duced during the simulated tests, performance immediately increased to the high 80% level and then gradually rose to the low 90% level.

After three consecutive simulated tests in which the participant performed more than 90% of the steps correctly and made no errors that would result in an inaccurate reading or risk infection, the checklist was presented without equipment labels, verbal prompts, or performance feedback. Use of the checklist only was associated with an initial decrement in performance, which was followed by a gradual rise in correct responding to the high 90% level in both simulated and actual tests. This level of performance always yielded accurate blood glucose readings and proper handling of the equipment for infection control. Intermittent baseline probes produced reversals in performance back to the level observed in the initial baseline phase, demonstrating that the checklist was responsible for the increase in correct responding.

This study showed that brief training and a task checklist significantly improved performance of a complicated self-assessment procedure in a client with memory impairments. The checklist developed in this study was an inexpensive and portable prosthetic memory aid that allowed the participant to independently manage a critical aspect of her medical regime. Whenever the participant's self-assessed blood glucose reading was outside of the accepted range, she would notify her caretaker and then either obtain an insulin injection to lower her blood glucose level or eat a carbohydrate or sugar-rich food

to raise her blood glucose level. At the time of her discharge from the rehabilitation program, the participant was using the checklist to perform her daily blood glucose self-assessments. In a telephone follow-up made 3 months after discharge, the participant's husband reported that she was still using the checklist successfully. He also stated that his wife's ability to independently perform these self-assessments was the most noteworthy improvement associated with her rehabilitation. Because this study involved only 1 subject with particular abilities and disabilities and a highly specialized task, replication with other subjects and types of tasks is needed to establish the general applicability of this intervention.

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